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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,102	06/26/2003	An L. Steegan	FIS920030051	1101
30449	7590	10/05/2004	EXAMINER	
SCHMEISER, OLSEN + WATTS			ECKERT II, GEORGE C	
SUITE 201			ART UNIT	
3 LEAR JET			PAPER NUMBER	
LATHAM, NY 12033			2815	

DATE MAILED: 10/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/604,102

Applicant(s)

STEEGAN ET AL.

Examiner

George C. Eckert II

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 27-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,6-14 and 19-26 is/are rejected.
- 7) ☒ Claim(s) 2-5 and 15-18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 6/26/03
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of the Group I invention (claims 1-26) in the reply filed on August 18, 2004 is acknowledged. The traversal is on the ground that a search for the invention of one inventive Group would include a search for the other Group. This is not found persuasive because, as pointed out in the restriction requirement, the restriction is proper based on the divergent status in the art of the two Groups, as shown by their different classifications. Moreover, that a search for one inventive Group may overlap with the search for the distinct Group is not sufficient evidence that the examination of both Groups simultaneously will not be a burden. The requirement is still deemed proper and is therefore made FINAL.

Specification

2. The disclosure is objected to because of the following informalities: throughout the specification, there is an "A" with a line over it and followed by a box (e.g. page 5, last sentence of para. 0006). It is believed it should be replaced with the symbol for angstroms: Å. Appropriate correction is required.

Claim Objections

3. Claims 3, 11 and 14 are objected to because of the following informalities: regarding claim 3, on line 2, delete "(i), (iii)" and insert --(i) and (iii)-- in its place. Regarding claim 11, on line 2, delete "are" and insert --is-- in its place. Regarding claim 14, on line 12, insert --second patterned-- before "masking layer" for proper distinction between layers. On line 17, insert --said-- before "vertical" as the vertical trench has already been cited. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 6-14 and 19-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 4,888,300 to Burton in combination with US 5,427,975 to Sparks et al. (Sparks). Regarding claims 1 and 14, Burton teaches in figures 2-13 a method of forming an isolation structure comprising:

forming an N-doped region 14 in a substrate

etching a vertical trench 20 in the substrate which trench extends into the N-doped region

(fig. 2A);

laterally etching the N-doped region to form a lateral trench communicating with and extending perpendicular to the vertical trench (fig. 8A); and

filling the lateral and vertical trenches with an insulating material "poly" (col. 4, lines 28-35).

Burton does not expressly disclose the method used to form the N-doped region and to form the vertical trench, specifically that they are formed by first and second masking patterns. Sparks teaches, with reference to figures 2a-c, a method of forming an N-doped region 12 and forming vertical trenches comprising two masking patterns. Sparks teaches:

Art Unit: 2815

forming a first patterned masking layer on a semiconductor substrate 10 whereby a portion of the substrate is exposed through an opening in the first masking layer (see col. 5, lines 45-68);

implanting ions into the exposed portion of the substrate to form a buried N-doped region 12 in the substrate (col. 5, lines 59-60);

removing the first masking layer (col. 5, lines 67-69) and forming a second patterned layer 16 on the substrate (col. 6, lines 22-34), an opening (generally at 20) in the second masking layer aligning over a less than whole portion of the buried N-doped region;

etching a vertical trench in the substrate through the opening in the second masking layer, the trench extending into the N-doped region (as seen in figure 2c); and

laterally etching the N-doped region to form a lateral trench communicating with and extending perpendicular to the vertical trench (see again fig. 2c).

At the time of the invention, it would have been obvious to combine Sparks with Burton. The motivation for doing so is that Burton merely indicates that the N-doped layer may be formed by any conventional method without providing details to do so (col. 3, lines 16-20) while Sparks provides specific steps to achieve the structure needed by Burton. As such, it is considered obvious to obtain the device of instant claims 1, 6-14 and 19-26.

Regarding claims 6-8 and 19-21, Burton teaches in figures 8A-9A the steps of partially filling the vertical and lateral trenches with a first insulating material 34 (as an insulating liner on all exposed surfaces) and completely filling the vertical and lateral trenches with a second insulating material "poly." The use of alternative insulation materials such as TEOS and HDP oxide is considered well known in the art as mere material substitutions. Regarding claims 9 and

Art Unit: 2815

22, although Sparks teaches a method wherein the epitaxial layer is formed after the N-doped region is formed, it is considered well known in the art and thus obvious to form the epitaxial layer first and then implant with ions to form the N-doped region. Regarding claims 10, 11, 23 and 24, Sparks teaches that the substrate is lightly doped P-type (col. 5, line 34) which is known in the art to be less than 1×10^{17} atm/cm³, that the N-doped region is formed by a dose of 5×10^{15} atm/cm² (col. 5, lines 60-63) and that the ions may be arsenic, phosphorous or antimony (col. 5, lines 49-50). Regarding claims 12 and 25, Burton teaches that the horizontal and lateral trenches are etched using separate processes (col. 4, lines 7-18). Regarding claims 13 and 26, Burton teaches forming MOS devices in the resultant isolated substrate (col. 4, lines 48-50).

Allowable Subject Matter

5. Claims 2-5 and 15-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.


Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additional cited art teaches various isolated devices using vertical and horizontal trenches.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to George C. Eckert II whose telephone number is (571) 272-1728. The examiner can normally be reached on 8:00 - 5:30, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


GEORGE ECKERT
PRIMARY EXAMINER